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METHOD OF MAKING A PRINTING MEMBER

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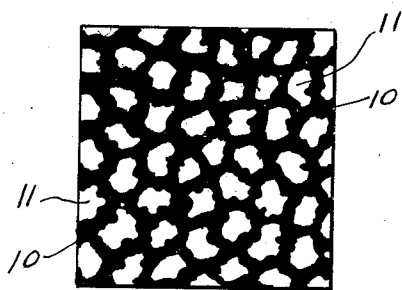


FIG. 1

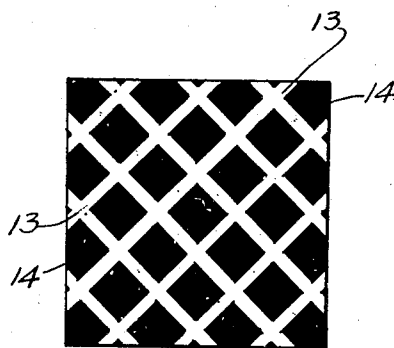


FIG. 2

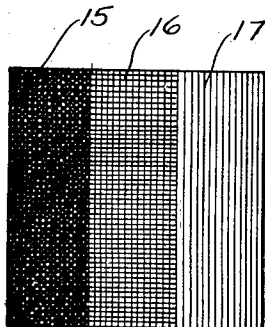


FIG. 3

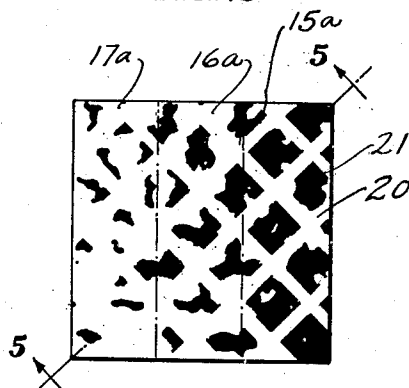


FIG. 4

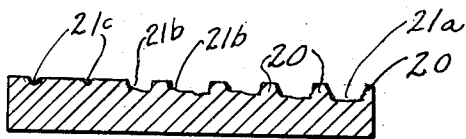


FIG. 5

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING A PRINTING MEMBER

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3 Claims. (Cl. 95—5.7)

This invention relates to a method of producing printing members, and more specifically to a method of producing printing plates or rolls particularly adapted for printing on textiles and other fabrics.

The general object of the present invention is to provide a novel and inexpensive method of producing, by a photographic process, printing plates or rolls suitable for printing of textile fabrics or other materials.

The difficulties in connection with the reproduction of designs on textile fabrics are largely due to the fact that printing on textiles an aniline or other dye is used in which the color is not as intense as in the case of an ordinary printing ink employed in printing on paper, for example. Furthermore, in fixing the dye, a large part of the color is washed out of the fabric. Accordingly, it is necessary to employ a super-abundance of pigment or dye in making the impression on the textile fabric. The chief difficulty in such printing lies in producing a printing plate capable of carrying sufficient pigment or dye and which will still preserve the fine gradations in tone.

Attempts have heretofore been made to employ ordinary photogravure plates for this purpose. Unfortunately, when such a plate is etched to a sufficient depth to carry the desired ink intensity in color and tone, the etching fluid must be of such strength that the usual resist fails to function in holding back the fluid in the semi-tone areas. In photogravure work, all printing portions of the plate have wells substantially of the same size, but of different depths, to carry correspondingly greater or smaller quantities of color material. In producing a plate for use on textiles, the etching fluid, because of its excessive strength, penetrates the resist too soon in the semi-tone areas, thus producing pockets almost as deep as those in the full-tone areas with the result that many of the semi-tones are lost and become full tones.

It has also been proposed to employ half-tone plates for textile printing, the plates being etched in the reverse of the ordinary half-tones,—that is, intaglio rather than relief plates are produced. In plates produced by the half-tone process, the amount of ink carried by the plates is varied by variations in the area of the small pockets or wells which carry the ink. When such plates are etched for textile printing, the small pockets or wells run together in the full-tone areas and the dividing walls are lost. Thus, when the plate is printed from, there is no support for the doctor blade, which tends to dip into the relatively large ink

retaining areas and to remove the ink, particularly in the full-tone printing areas. Furthermore, such a plate cannot be "topped" with a coating of acid-resisting etching varnish and re-etched to produce pockets of greater depth, for the etching varnish is apt to run into the ink-retaining pockets in various parts of the plate or roll.

Because of the unsatisfactory results obtained by both photogravure and half-tone processes, 10 as applied to textile printing, the methods now largely used for producing intaglio plates for textile printing, are mechanical, rather than photographic, the metal being removed from the plate or roll by use of an engraver's hand tool or by 15 means of die engraving or by a hand-etching process, all of which are expensive and require highly skilled labor.

My present invention contemplates a combination of the ordinary photogravure and half-tone 20 processes, whereby a plate can be produced which will carry the necessary large quantities of pigment material and which will also preserve all of the fine gradations in tone, thereby enabling accurate reproductions of natural or other objects 25 or designs to be made on textile fabrics.

The invention also contemplates a process which can be carried out rapidly, and which requires only a minimum degree of care and average skill to produce an excellent result. 30

According to the present invention, a plate is produced embodying the advantages of both the photogravure plate and the usual reversed half-tone plate,—that is, a plate made according to the process disclosed herein will have distinct 35 ink-retaining wells separated by continuous walls, which will provide a surface for supporting the doctor blade, and will also embody the large ink capacity of a deeply etched intaglio half-tone plate. Furthermore, the plate may be 40 locally "topped" with a coating of etching varnish, after the original etching has been completed, and then locally etched to a greater degree without destroying the tonal variations or the pocket dividing walls. 45

In carrying out the process, the photographic reproduction made from the original subject to be reproduced is first exposed through a half-tone screen and in making the carbon resist from this reproduction a photogravure screen is employed. 50 Various steps of the process are illustrated in the accompanying drawing, in which Fig. 1 is a greatly enlarged view of an irregular grain half-tone screen; Fig. 2 is a similarly enlarged view of a photogravure screen; Fig. 3 is a diagram- 55

matic representation of a portion of the subject to be reproduced embodying light, intermediate and dark portions; Fig. 4 is a greatly enlarged plan view of the printing plate; Fig. 5 is a section along the lines 5—5 on Fig. 5.

The first steps in the production of the plate are very similar to the first steps in the production of an ordinary half-tone plate, a photographic camera being employed to obtain a continuous tone negative from the subject to be reproduced. From this continuous tone negative a half-tone positive is made by means of a screen. This may be accomplished in an ordinary enlarging apparatus, provided with the usual lens, and an iris diaphragm or stop. A screen is interposed between the sensitive photographic plate and the lens. The apparatus is focused in the usual manner so that images of the subject, as reproduced on the negative and of the stop, are both formed in the proper position on the plate which is to become the positive, the screen being spaced away from the negative such a distance that the minute openings therein produce minute images of the stop on the plate or film. This is the usual procedure in producing a half-tone plate for use in conjunction with half-tone intaglio printing and produces a positive having dark dots thereon, the dots varying in size in accordance with the light, with the result that where the subject is brightest the dark dots are largest.

In ordinary half-tone work a ruled screen, consisting of opaque lines on a transparent plate, is employed, the lines being straight and intersecting each other substantially at right angles. However, in the present process I prefer to employ a stippled or grained or wavy lined screen in producing the half-tone positive, in order to avoid the possibility of confusion or approximate register of the half-tone screen with the photogravure screen and the production of unpleasant moire effects. Such a screen is illustrated in Fig. 1 of the drawing, in which dark portions 10 are curved in an irregular manner and intersect in such a way as to provide transparent or light portions 11 of irregular shape and slightly varying sizes.

The positive may be made of the same size as the negative or it may be enlarged or reduced, depending upon the size of the design required. The positive is used in the production of the carbon resist, and on the resist the dots of varying size will be substantially unaffected by the light.

In producing a carbon resist from the positive film or plate, the procedure is substantially the same as that employed in ordinary photogravure work, the resist being first exposed to light shining through the usual photogravure screen, illustrated in Fig. 2, which consists of transparent intersecting lines 13, with dark opaque squares 14 at the intersections of the lines. In order to avoid any possibility of unpleasant moire effects in connection with either the texture of the fabric or with the grain of the half-tone plate, a wavy line screen may also be employed in this step, although a screen of the type illustrated will give satisfactory results. The usual method of exposing the carbon resist is followed, the photogravure screen being placed in contact with the carbon resist, so that the effect of the screen will be to expose a series of criss-cross lines on the resist to the action of light, thereby hardening the gelatin which has been exposed. The portions of the resist adjacent the dark spots on the screen are unaffected by any light.

The next step is to expose the carbon resist

to light passing through the positive. The effect of such exposure is to photograph the design of the half-tone positive onto the carbon resist, the resist being hardened in the light areas and being unaffected in the dark portions.

The resist is then applied to a copper plate or roll in the usual manner and etched with a solution of, for example, ferric chloride, thus producing the plate illustrated in Figs. 5 and 6. Because of the character of the resist, no particular care is required in the etching process. If further etching is required, it is only necessary to apply a coating of etching varnish, with a roll, to the tops of the dividing walls between the pockets and re-etch the plate so that it will carry more pigment.

It will be noted that the plate is a reverse of the original subject; that is, in the subject as shown diagrammatically in Fig. 3, the dark portion 15 is at the left, the intermediate portion 16 in the center, and the light portion 17 at the right, and in the plate the position of the corresponding portions are reversed, the deeply etched portion 15a being at the right, the intermediate portion 16a in the center, and the lightly etched portion 17a at the left. This is done to secure a proper reproduction by direct printing and may be accomplished by proper position of the negative in making the positive to secure a reversal of the positive with relation to the original.

The distinction between the plates made according to my process and the ordinary photogravure plates and half-tone plates may readily be seen by an examination of Figs. 4 and 5 of the drawing. As shown in the drawing, the dividing walls 20 are of the same height throughout the surface of the plate as is the case with the ordinary photogravure plates. However, in the photogravure process the etched away portions of the plates between the dividing walls are of substantially the same area and of varying depth, whereas in the present plate the etched away portions 21 vary in area because of the effect of the half-tone screen and vary slightly in depth. Thus, in the full-tone or darkened printing zone of the plate the portions 21a occupy substantially the entire area between the dividing walls. In the middle tone portions the recesses 21b are slightly smaller in area and in the light portions the area of the recesses 21c is still smaller. The variation in the area of the recesses is similar to that in a half-tone plate etched for intaglio printing, but in an ordinary half-tone plate the dividing walls between the recesses in the full-tone areas of the plate would be lost, whereas the walls are present even in the deeply etched portions of a plate made by my process.

This result is produced by the difference in the action of the etching fluid through the resist produced by my process. In the usual photogravure process the etching fluid first penetrates to the area between the lines on the screen in the black and gradually penetrates through the middle and lighter tones of the resist, the variation in tone being secured by the difference in the speed of the penetration of the resist in different portions of the plate. Thus different portions of the plate are subject to the etching action for varying periods of time, and the tonal variations are obtained by differences in the depth of the ink-retaining pockets.

In the ordinary half-tone process the acid penetrates the resist throughout its entire area at substantially the same time, the variation in tone being produced by the difference in area

of the dots formed by the screen. In my process the acid penetrates substantially the entire area of the plates at the same time in the areas bounded by the lines of the photogravure screen, but the lines on the resist formed by the photogravure screen prevent the larger dots from running together and thus the dividing walls are preserved intact, even in the deepest tones of the plate.

Thus, by means of the present process the advantage of the half-tone plate of the ability to hold a sufficient amount of ink is obtained, and the doctor blade supporting surface of the walls is maintained, as in the case of the photogravure process. As the area of the recesses varies, in accordance with the tones of the plates, the amount of ink carried by the plate is always proportional to the amount of light passing through the negative, and thus the gradation of tone is preserved so long as the etching is not carried far enough to destroy the dividing walls. It is therefore possible to make a strong etching which will carry a large amount of ink and which will still preserve the fine gradations in tone. Also, even in the blacked parts or solid tone regions of the plate, the dividing walls are maintained and a surface for supporting the doctor blade is provided, thus preventing the doctor blade from wiping out the ink in the deep portions, and also providing a wearing surface, insuring long life of the plate.

In the present specification, I have described a preferred method of carrying out my invention. Obviously, various modifications can be made within the scope of the invention. For example, different types of screens may be employed or the various steps of the process may be carried out in different orders and it is to be understood that the scope of the invention, as defined by the claims, is not limited by the foregoing description of a preferred method.

I claim:

1. A method of producing printing members, including the step of producing a photographic reproduction of the subject to be reproduced, in which the varying tones of the original are re-

produced by minute light and dark portions, the areas of said portions varying in accordance with the tones of the original, preparing a resist through the medium of a photogravure screen whereby the gelatin of the resist will be hardened corresponding to the light lines on the screen, exposing said resist to the action of light through said photographic reproduction, and etching a printing plate through said resist, thereby producing a printing member for intaglio printing in which the depth and area of the ink containing pockets will vary in accordance with the tones of the subject to be reproduced, but in which definite dividing walls will be preserved between the ink retaining pockets even in the deepest etched portions of the members.

2. A method of producing printed plates comprising preparing a photographic reproduction of the subject through a half-tone screen, exposing a carbon resist to the action of light through a photogravure screen and through said photographic reproduction whereby a resist is produced in which the area of the hardened gelatin will vary in accordance with the tones of the subject, the gelatin being unaffected in minute dots of varying area, the area of the dots in no case exceeding the area of the opaque portions of the photogravure screen, and thereafter etching a printing member through said carbon resist.

3. A method of producing printing plates comprising preparing a photographic negative of the subject to be reproduced, preparing a positive from such negative, by means of a half-tone screen, exposing a carbon resist to the action of light through a photogravure screen and through said positive, etching a printing member through said carbon resist, thereby producing a printing member having ink containing pockets of varying sizes and depths, the ink containing pockets throughout the plate and within the darkest tones thereof being separated by continuous intermediate walls, and thereafter applying a coating of etching varnish to said walls and locally re-etching said plate to produce the desired depth of ink-retaining pockets.

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